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EXAMINER
KRECK, JOHN J

ART UNIT	PAPER NUMBER
3673	

DATE MAILED: 06/12/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 07-01)

Office Action Summary	Application No.	Applicant(s)	
	09/841,433	WELLINGTON ET AL.	
	Examiner	Art Unit	
	John Kreck	3673	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____ .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1883-1960,5396 and 5397* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1883-1960,5396 and 5397* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☒ The proposed drawing correction filed on *26 February 2002* is: a)☒ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) *6,7,8,9,12*
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

The preliminary amendments dated 10/3/01 and 2/26/01 have been entered.

Specification

1. The lengthy specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

Drawings

2. The proposed drawing correction and/or the proposed substitute sheets of drawings, filed on 2/26/2002 have been approved. A proper drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The correction to the drawings will not be held in abeyance.

Double Patenting

3. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970);and, *In re Thorington,* 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

4. Claims 1883-1960 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over copending applications (including the present application): 09/840,936; 09/840,937; 09/841,000; 09/841,060; 09/841,061; 09/841,127; 09/841,128; 09/841,129; 09/841,130; 09/841,131; 09/841,170; 09/841,193; 09/841,194; 09/841,195; 09/841,238; 09/841,239; 09/841,240; 09/841,283; 09/841,284; 09/841,285; 09/841,286; 09/841,287; 09/841,288; 09/841,289; 09/841,290; 09/841,291; 09/841,292; 09/841,293; 09/841,294; 09/841,295; 09/841,296; 09/841,297; 09/841,298; 09/841,299; 09/841,300; 09/841,301; 09/841,302; 09/841,303; 09/841,304; 09/841,305; 09/841,306; 09/841,307; 09/841,308; 09/841,309; 09/841,310; 09/841,311; 09/841,312; 09/841,429; 09/841,430; 09/841,431; 09/841,432; 09/841,433; 09/841,434; 09/841,435; 09/841,436; 09/841,437; 09/841,438; 09/841,439; 09/841,440; 09/841,441; 09/841,442; 09/841,443; 09/841,444; 09/841,445; 09/841,446; 09/841,447; 09/841,448; 09/841,449; 09/841,488; 09/841,489; 09/841,490; 09/841,491; 09/841,492; 09/841,493; 09/841,494; 09/841,495; 09/841,496; 09/841,497; 09/841,498; 09/841,499; 09/841,500; 09/841,501; 09/841,502; 09/841,632; 09/841,633; 09/841,634; 09/841,635; 09/841,636; 09/841,637; 09/841,638; and 09/841,639.

Although the conflicting claims are not identical, they are not patentably distinct from other. At least one other application includes a set of claims which are substantially identical to the claims in this application; but which call for coal containing formation rather than hydrocarbon. Since applicant has defined hydrocarbon containing formation as including coal; this would be an obvious variation.

37 CFR 1.78(b) provides that when two or more applications filed by the same applicant contain conflicting claims, elimination of such claims from all but one application may be required in the absence of good and sufficient reason for their retention during pendency in more than one application. The discussion below sets forth the Office's basis for its determination that each of these ninety one applications contains at least one claim that conflicts with another one of the related co-pending applications identified above. Each of these ninety one applications includes the same

specification and collectively these ninety one applications present over five thousand claims. The Office has shown that each of these ninety one applications contains at least one claim that conflicts with another one of the related co-pending applications identified above, and an analysis of each of five thousand claims in the ninety one related co-pending applications would be an extreme burden on the Office requiring tens of thousands of claim comparisons. Therefore, the Office is requiring applicant to resolve the conflict between these applications and comply with 37 CFR 1.78(b) by either:

(1) filing a terminal disclaimer in each of the related ninety-one applications terminally disclaiming each of the other ninety applications; or,

(2) provide a statement that all claims in the ninety applications have been reviewed by applicant and that no conflicting claims exist between the applications. Such a statement must set forth factual information to identify how all the claims in the instant application are distinct and separate inventions from all the claims in the above identified ninety applications.

See MPEP 804.02 IV for a discussion of multiple double patenting rejections and the requirements for a single terminal disclaimer.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> **The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.**

5. Claims 1883-1960 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

6. Claims 1919 and 1958 are unclear regarding "at least about 7 heat sources". The modified "about" is not normally used in reference to an integer count (i.e., a number of sources); thus it is unclear what the scope of the claim is. Would "5" or "6" be considered to be "about 7"?

7. While applicant may be his or her own lexicographer, a term in a claim may not be given a meaning repugnant to the usual meaning of that term. See *In re Hill*, 161 F.2d 367, 73 USPQ 482 (CCPA 1947). The term "hydrocarbon" is defined in the specification extremely broadly as: "organic material that contains carbon and hydrogen in their molecular structures" while the accepted meaning is "an organic compound containing only carbon and hydrogen." Applicant's definition of hydrocarbon is rather vague: would substances such as trona, gypsum, or carbonic acid be included in this definition of hydrocarbon? It is also noted that applicant's definition includes a plural for "molecular structures"; thus apparently leaving open the possibility of a mixture of a hydrogen containing substance and a carbon containing substance falling within the term "hydrocarbon". Applicant's vague definition of "hydrocarbon" is much broader than

the accepted meaning of the term and this makes it impossible for one of ordinary skill in the art to ascertain the scope of the claims which include the term "hydrocarbon".

8. Claims 1892 and 1931 call for the heating energy to be equal to or less than Pwr. Pwr is defined using an ideal equation for heating. Since this equation fails to take into account the endothermic nature of pyrolysis reactions, and heat loss to adjacent formations; it is not clear how the heating energy can be equal to or less than Pwr.

9. Claims 1906 and 1945 are unclear regarding "non-condensable component". It is noted that the specification provides a definition for "non-condensable hydrocarbon"; however it is not clear whether this definition applies to this component.

10. Claims 1917 and 1956 are unclear regarding "substantially uniformly increasing a permeability". Does this mean "increasing a permeability *to a substantially uniform value*" or "increasing a permeability *by a substantially uniform amount*"?

11. Claims 1885 and 1924 are unclear regarding "a pyrolysis temperature range". This is unclear because it does not specify the range. Some unstable compounds are known to pyrolyze at relatively low temperatures. Would a temperature of 35°C be considered to be within "a pyrolysis temperature range"?

12. Claims 1891 and 1930 are unclear regarding "during pyrolysis". A step of pyrolysis has not been positively claimed, thus the scope of this claim is unclear.

13. Claims 1906 and 1945 call for the hydrogen to be between 10% and 80% of the non-condensable component by volume. The claim does not specify any other conditions such as pressure or temperature. It is noted that many such processes produce a mixture at high pressure. Although gases behave ideally near atmospheric

pressure; the product gases of the claimed process deviate significantly from ideal gas law at high pressures. Furthermore, applicant's definition of "condensable" uses a reference of 25°C; although chemists usually refer to gas measurements at STP. There are some products of this process which condense between 25°C and STP. Such condensation would affect the relative volumes. Without any benchmark temperature and pressure, it is impossible to ascertain the scope of the claim with precision.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

14. Claims 1883-1889,1893-1906,1909-1911, 1916-1918 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsai, et al. (U.S. Patent number 4,299,285).

The Tsai reference teaches a method for treating a hydrocarbon formation in situ comprising providing heat from one or more heat sources to a portion of the formation; allowing heat to transfer, and producing a mixture. The Tsai reference fails to disclose the formation has a at least a portion with an atomic hydrogen to carbon ratio of greater than 0.70 and less than 1.65. According to "Coalbed Methane" (see, in particular figure

2.5; and the text in section 2.2.2, third paragraph) most coals include portions which fall within this range; thus it would have been obvious to one of ordinary skill in the art at the time of the invention to have practiced the Tsai method in a coal seam having at least a portion with an atomic hydrogen to carbon ratio of greater than 0.70 and less than 1.65 as called for in claim 1883.

With regards to claim 1884; the Tsai reference fails to explicitly teach the superposition of heat sources. It is apparent that one of ordinary skill in the art would know that the heat sources should be spaced to substantially heat the entire formation. Any configuration of heat sources that provides heat to the entire formation would inherently cause superposition of heat; thus it would have been obvious to one of ordinary skill in the art at the time of the invention to have further modified the Tsai method to have included superposition of heat as called for in claim 1884; in order to ensure that the entire formation is heated.

With regards to claim 1885; the Tsai reference teaches a pyrolysis temperature range within a section of the formation (see col. 4, line 54).

With regards to claim 1886, electrical heaters are well known to heat air. It would have been obvious to one of ordinary skill in the art at the time of the invention to have used an electrical heater with the Tsai process as called for in claim 1886, in order to heat the air.

With regards to claim 1887, surface burners are well known to heat air. It would have been obvious to one of ordinary skill in the art at the time of the invention to have

used a surface burner with the Tsai process as called for in claim 1887, in order to heat the air.

With regards to claim 1888; the Tsai reference teaches a flameless combustor (see col. 2, line 32).

With regards to claim 1889; the Tsai reference teaches a natural distributed combustor (see col. 2, line 32).

With regards to claim 1893; the Tsai reference does not explicitly teach the transferring by conduction; however this is inherent in a solid substance such as coal. Even though the bulk of the heating in the Tsai method may be done by convection; it is apparent that some unfractured coal must remain, and thus the allowing heat to transfer comprises transferring heat substantially by conduction (that is, substantially within the unfractured portions).

With regards to claim 1894; the Tsai reference does not teach the thermal conductiviy; however, it would have been further obvious to one of ordinary skill in the art at the time of the invention to have practiced the Tsai method in a coal seam having a thermal conductivity of greater than about 0.5W/(m°C) as called for in claim 1894; such a formation would be a desirable choice because it would heat more uniformly.

With regards to claims 1895-1906, 1910, and 1911; the nature of hydrocarbons produced from such heating is highly variable, and dependent upon many factors, not least of which is the characteristics of the coal. The components of the produced mixture are deemed to be the results of design variables, including coal characteristics and temperature. Also, specifically with respect to claims 1898-1900; hydrocarbons

produced using the Tsai method inherently have less than 1% nitrogen, oxygen, or sulfur.

With regards to claim 1909, the Tsai reference teaches the pressure greater than 2.0 bar.

With regards to claims 1916 and 1917; the Tsai reference teaches the permeability greater than about 100 md in table 1. The uniform increase in permeability is inherent.

With regards to claim 1918, although the Tsai reference fails to explicitly disclose a Fischer Assay; it is apparent that the disclosed process will yield greater than 60%.

15. Claim 1890 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tsai in view of Elkins (U.S. Patent number 2,734,579).

The Tsai reference fails to teach the controlling the temperature and pressure wherein the temperature is controlled as a function of the pressure or the pressure is controlled as a function of the temperature.

Elkins teaches controlling the pressure in order to lower the temperature (col. 3, line 46); this is done in order to help prevent overheating. It would have been obvious to one of ordinary skill in the art at the time of the invention to have further modified the Tsai process to have included the temperature is controlled as a function of the pressure or the pressure is controlled as a function of the temperature as called for in claim 1890, and as taught by Elkins, in order to prevent overheating.

16. Claims 1891 and 1892 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsai in view of Kasevich, et al. (U.S. Patent number 4,457,365).

The Tsai reference fails to teach the heating rate. With regards to claim 1892; it is known to heat at rates of less than 10°C per day, as shown by Kasevich (figure 3). It is apparent that this low heating rate is desirable because it results in more uniform heating, and reduces the possibility of hot spots. It would have been obvious to one of ordinary skill in the art at the time of the invention to have further modified the Tsai method to have included heating at a rate of less than about 10°C per day as called for in claim 1892, in order to achieve more uniform heating. The claim limitations drawn to the heating energy are nothing more than well known thermodynamic equations.

With regards to claim 1891; it is noted that Kasevich teaches an average of approximately 1.6°/day. It is apparent that when the temperature reaches its highest point (the point at which pyrolysis occurs) the rate of increase would be at the slowest; thus it would be less than about 1°C/day. It would have been further obvious to one of ordinary skill in the art at the time of the invention to have further modified the Tsai method to have included heating at less than about 1°C/day during pyrolysis as called for in claim 1891; in order to achieve more uniform heating.

17. Claims 1907 and 1908 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsai, et al. in view of Stoddard, et al. (U.S. Patent number 4,463,807).

The Tsai reference fails to explicitly teach the ammonia.

It is well known that ammonia is a byproduct of such heating of coal. This is taught by Stoddart. It is readily apparent that the amount of ammonia is dependent on many design factors, including the formation characteristics (hydrocarbon content, etc.). It would have been obvious to one of ordinary skill in the art at the time of the invention to have practiced the Tsai method, as modified, in a formation with characteristics allowing greater than 0.05% of the produced mixture to be ammonia, as called for in claim 1907.

With regards to claim 1908; it is well known that one of the chief uses for ammonia is fertilizer; thus it would have been further obvious to one of ordinary skill in the art at the time of the invention to have used ammonia produced form the coal seam for fertilizer as called for in claim 1908.

18. Claims 1912-1915 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsai, et al. in view of Gregoli, et al. (U.S. Patent number 6,016,867).

The Tsai reference fails to teach the altering pressure to inhibit production of hydrocarbons having carbon numbers greater than about 25. The Gregoli reference teaches that in a similar in-situ processes, it is beneficial to use high pressure to break heavy hydrocarbons. It is well known that carbons having carbon numbers greater than about 25 are considered to be heavy; and impede production because they are dense and viscous. It would have been obvious to one of ordinary skill in the art at the time of the invention to have modified the Tsai method to have included altering pressure to

inhibit production of hydrocarbons having carbon numbers greater than about 25, as called for in claim 1912, in order to improve production.

The Tsai reference fails to teach the recirculating hydrogen, providing hydrogen, or hydrogenating. The Gregoli reference teaches that in a similar in-situ processes, it is beneficial to use hydrogen to hydrogenate heavy hydrocarbons. It is well known that carbons having carbon numbers greater than about 25 are considered to be heavy; and impede production because they are dense and viscous. It would have been obvious to one of ordinary skill in the art at the time of the invention to have modified the Tsai method to have included recirculating hydrogen as called for in claims 1913; providing hydrogen as called for in claims 1914; and hydrogenating as called for in claims 1915; in order to reduce the heavy hydrocarbons and to improve production.

19. Claim 1919 and 1920 and 5396 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsai, et al. (U.S. Patent number 4,299,285) in view of Van Meurs, et al. (U.S. Patent number 4,886,118).

The Tsai reference fails to teach the at least about 7 heat sources for each production well. Note that Tsai teaches: "*the principles are applicable to a multiple of interrelated injection and production wells*" (col. 2, line 8).

The Van Meurs reference teaches a similar in situ heating system, and further teaches that six or twelve heat sources for each production well significantly increases the production (col. 8, line 24).

It would have been obvious to one of ordinary skill in the art at the time of the invention to have modified the Tsai method to have included at least about 7 heat

sources disposed in the formation for each production well, as called for in claim 1919, in order to improve production.

With regards to claim 1920; the Van Meurs reference teaches the heat sources surrounding the production well; since this includes at least 3 sources this inherently includes a triangle. It would have been further obvious to one of ordinary skill in the art at the time of the invention to have further modified the Tsai method to have included at least 3 sources in a triangle as called for in claim 1920, in order to increase production.

With regards to claim 5396; is apparent that the number of heat sources is largely a matter of engineering design. It would have been obvious to one of ordinary skill in the art at the time of the invention to have used at least about 20 heat sources for each production well, as called for in claim 5396, based on the desired heating rate and formation heat transmission characteristics.

20. Claim 1921 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tsai, at al.; Van Meurs, et al.; and Salomonsson (U.S. Patent number 2,914,309).

The Van Meurs and Tsai references fail to explicitly teach the unit of heat sources in a triangular pattern and the plurality of units in a repetitive pattern. It is noted that the Van Meurs reference teaches the heat sources surrounding the production well, which would inherently include a triangular pattern.

Salomonsson teaches that it is desirable to have a repetitive pattern in order to cover the area evenly. It is apparent that this is beneficial in order to prevent hot spots. It would have been further obvious to one of ordinary skill in the art at the time of the invention to have further modified the Tsai method to have included a unit of a triangular

pattern and a repetitive pattern of units as called for in claim 1921; in order to cover the area evenly.

Regarding independent claim 1922:

The Tsai reference teaches a method for treating a hydrocarbon formation in situ comprising providing heat from one or more heat sources to a portion of the formation; allowing heat to transfer, and producing a mixture. The Tsai reference fails to disclose the formation has a at least some hydrocarbons with an atomic hydrogen to carbon ratio of greater than 0.70 and less than 1.65. According to "Coalbed Methane" (see, in particular figure 2.5; and the text in section 2.2.2, third paragraph) most coals include portions which fall within this range; thus it would have been obvious to one of ordinary skill in the art at the time of the invention to have practiced the Tsai method in a coal seam having at least a portion with an atomic hydrogen to carbon ratio of greater than 0.70 and less than 1.65 as called for in claim 1922.

With regards to claim 1923; the Tsai reference fails to explicitly teach the superposition of heat sources. It is apparent that one of ordinary skill in the art would know that the heat sources should be spaced to substantially heat the entire formation. Any configuration of heat sources that provides heat to the entire formation would inherently cause superposition of heat; thus it would have been obvious to one of ordinary skill in the art at the time of the invention to have further modified the Tsai method to have included superposition of heat as called for in claim 1884; in order to ensure that the entire formation is heated.

With regards to claim 1924; the Tsai reference teaches a pyrolysis temperature range within a section of the formation (see col. 4, line 54).

With regards to claim 1925, electrical heaters are well known to heat air. It would have been obvious to one of ordinary skill in the art at the time of the invention to have used an electrical heater with the Tsai process as called for in claim 1925, in order to heat the air.

With regards to claim 1926, surface burners are well known to heat air. It would have been obvious to one of ordinary skill in the art at the time of the invention to have used a surface burner with the Tsai process as called for in claim 1926, in order to heat the air.

With regards to claim 1927; the Tsai reference teaches a flameless combustor (see col. 2, line 32).

With regards to claim 1928; the Tsai reference teaches a natural distributed combustor (see col. 2, line 32).

With regards to claim 1932; the Tsai reference does not explicitly teach the transferring by conduction; however this is inherent in a solid substance such as coal. Even though the bulk of the heating in the Tsai method may be done by convection; it is apparent that some unfractured coal must remain, and thus the allowing heat to transfer comprises transferring heat substantially by conduction (that is, substantially within the unfractured portions).

With regards to claim 1933; the Tsai reference does not teach the thermal conductiviy; however, it would have been further obvious to one of ordinary skill in the

art at the time of the invention to have practiced the Tsai method in a coal seam having a thermal conductivity of greater than about 0.5W/(m°C) as called for in claim 1933; such a formation would be a desirable choice because it would heat more uniformly.

With regards to claims 1934-1945, 1949, and 1950; the nature of hydrocarbons produced from such heating is highly variable, and dependent upon many factors, not least of which is the characteristics of the coal. The components of the produced mixture are deemed to be the results of design variables, including coal characteristics and temperature. Also, specifically with respect to claims 1937-1939; hydrocarbons produced using the Tsai method inherently have less than 1% nitrogen, oxygen, or sulfur.

With regards to claim 1948, the Tsai reference teaches the pressure greater than 2.0 bar.

With regards to claims 1955 and 1956; the Tsai reference teaches the permeability greater than about 100 md in table 1. The uniform increase in permeability is inherent.

With regards to claim 1957, although the Tsai reference fails to explicitly disclose a Fischer Assay; it is apparent that the disclosed process will yield greater than 60%.

21. Claim 1929 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tsai in view of Elkins (U.S. Patent number 2,734,579).

The Tsai reference fails to teach the controlling the temperature and pressure wherein the temperature is controlled as a function of the pressure or the pressure is controlled as a function of the temperature.

Elkins teaches controlling the pressure in order to lower the temperature (col. 3, line 46); this is done in order to help prevent overheating. It would have been obvious to one of ordinary skill in the art at the time of the invention to have further modified the Tsai process to have included the temperature is controlled as a function of the pressure or the pressure is controlled as a function of the temperature as called for in claim 1929, and as taught by Elkins, in order to prevent overheating.

22. Claims 1930 and 1931 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsai in view of Kasevich, et al. (U.S. Patent number 4,457,365).

The Tsai reference fails to teach the heating rate. With regards to claim 1931; it is known to heat at rates of less than 10°C per day, as shown by Kasevich (figure 3). It is apparent that this low heating rate is desirable because it results in more uniform heating, and reduces the possibility of hot spots. It would have been obvious to one of ordinary skill in the art at the time of the invention to have further modified the Tsai method to have included heating at a rate of less than about 10°C per day as called for in claim 1931, in order to achieve more uniform heating. The claim limitations drawn to the heating energy are nothing more than well known thermodynamic equations.

With regards to claim 1930; it is noted that Kasevich teaches an average of approximately 1.6°/day. It is apparent that when the temperature reaches its highest point (the point at which pyrolysis occurs) the rate of increase would be at the slowest; thus it would be less than about 1°C/day. It would have been further obvious to one of ordinary skill in the art at the time of the invention to have further modified the Tsai method to have included heating at less than about 1°C/day during pyrolysis as called for in claim 1930; in order to achieve more uniform heating.

23. Claims 1946 and 1947 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsai, et al. in view of Stoddard, et al. (U.S. Patent number 4,463,807).

The Tsai reference fails to explicitly teach the ammonia.

It is well known that ammonia is a byproduct of such heating of coal. This is taught by Stoddart. It is readily apparent that the amount of ammonia is dependent on many design factors, including the formation characteristics (hydrocarbon content, etc.). It would have been obvious to one of ordinary skill in the art at the time of the invention to have practiced the Tsai method, as modified, in a formation with characteristics allowing greater than 0.05% of the produced mixture to be ammonia, as called for in claim 1946.

With regards to claim 1947; it is well known that one of the chief uses for ammonia is fertilizer; thus it would have been further obvious to one of ordinary skill in

the art at the time of the invention to have used ammonia produced form the coal seam for fertilizer as called for in claim 1947.

24. Claims 1951-1954 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsai, et al. in view of Gregoli, et al. (U.S. Patent number 6,016,867).

The Tsai reference fails to teach the altering pressure to inhibit production of hydrocarbons having carbon numbers greater than about 25. The Gregoli reference teaches that in a similar in-situ processes, it is beneficial to use high pressure to break heavy hydrocarbons. It is well known that carbons having carbon numbers greater than about 25 are considered to be heavy; and impede production because they are dense and viscous. It would have been obvious to one of ordinary skill in the art at the time of the invention to have modified the Tsai method to have included altering pressure to inhibit production of hydrocarbons having carbon numbers greater than about 25, as called for in claim 1951, in order to improve production.

The Tsai reference fails to teach the recirculating hydrogen, providing hydrogen, or hydrogenating. The Gregoli reference teaches that in a similar in-situ processes, it is beneficial to use hydrogen to hydrogenate heavy hydrocarbons. It is well known that carbons having carbon numbers greater than about 25 are considered to be heavy; and impede production because they are dense and viscous. It would have been obvious to one of ordinary skill in the art at the time of the invention to have modified the Tsai method to have included recirculating hydrogen as called for in claims 1952; providing hydrogen as called for in claims 1953; and hydrogenating as called for in claims 1954;

in order to reduce the heavy hydrocarbons and to improve production.

25. Claims 1958 and 1959 and 5397 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsai, et al. (U.S. Patent number 4,299,285) in view of Van Meurs, et al. (U.S. Patent number 4,886,118).

The Tsai reference fails to teach the at least about 7 heat sources for each production well. Note that Tsai teaches: "*the principles are applicable to a multiple of interrelated injection and production wells*" (col. 2, line 8).

The Van Meurs reference teaches a similar in situ heating system, and further teaches that six or twelve heat sources for each production well significantly increases the production (col. 8, line 24).

It would have been obvious to one of ordinary skill in the art at the time of the invention to have modified the Tsai method to have included at least about 7 heat sources disposed in the formation for each production well, as called for in claim 1958, in order to improve production.

With regards to claim 1959; the Van Meurs reference teaches the heat sources surrounding the production well; since this includes at least 3 sources this inherently includes a triangle. It would have been further obvious to one of ordinary skill in the art at the time of the invention to have further modified the Tsai method to have included at least 3 sources in a triangle as called for in claim 1959, in order to increase production.

With regards to claim 5397; is apparent that the number of heat sources is largely a matter of engineering design. It would have been obvious to one of ordinary skill in the art at the time of the invention to have used at least about 20 heat sources for

each production well, as called for in claim 5397, based on the desired heating rate and formation heat transmission characteristics.

26. Claim 1960 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tsai, at al.; Van Meurs, et al.; and Salomonsson (U.S. Patent number 2,914,309).

The Van Meurs and Tsai references fail to explicitly teach the unit of heat sources in a triangular pattern and the plurality of units in a repetitive pattern. It is noted that the Van Meurs reference teaches the heat sources surrounding the production well, which would inherently include a triangular pattern.

Salomonsson teaches that it is desirable to have a repetitive pattern in order to cover the area evenly. It is apparent that this is beneficial in order to prevent hot spots. It would have been further obvious to one of ordinary skill in the art at the time of the invention to have further modified the Tsai method to have included a unit of a triangular pattern and a repetitive pattern of units as called for in claim 1960; in order to cover the area evenly.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to John Kreck whose telephone number is (703)308-2725. The examiner can normally be reached on 6:30-3:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Heather Shackelford can be reached on (703)308-2978. The fax phone numbers for the organization where this application or proceeding is assigned are (703)305-3597 for regular communications and (703)305-7687 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703)306-4177.

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JJK
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